HAF2015RJ

Silicon N Channel MOS FET Series
Power Switching

HITACHI

ADE-208-933 (Z)
1st. Edition
Dec. 2000

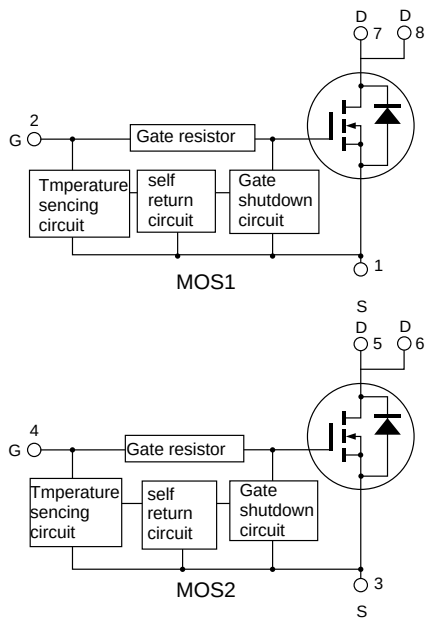
This FET has the over temperature shut–down capability sensing to the junction temperature. This FET has the built–in over temperature shut–down circuit in the gate area. And this circuit operation to shut–down the gate voltage in case of high junction temperature like applying over power consumption, over current etc.

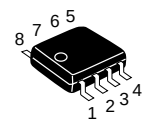
Features

- Logic level operation (5 to 6 V Gate drive)
- High endurance capability against to the short circuit
- Built–in the over temperature shut–down circuit
- Temperature hysteresis type.
- High density mounting.

Outline

SOP-8





1, 3	Source
2, 4	Gate
5, 6, 7, 8	Drain

Hitachi semiconductor

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	16	V
Gate to source voltage	V_{GSS}	–2.5	V
Drain current	I_D	2	A
Drain peak current	$I_{D(pulse)}$ Note1	4	A
Body-drain diode reverse drain current	I_{DR}	2	A
Avalanche current	I_{AP} Note4	0.54	A
Avalanche energy	E_{AR} Note4	25	mJ
Channel dissipation	Pch Note2	2	W
Channel dissipation	Pch Note3	1.5	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Note: 1. PW ≤ 10 µs, duty cycle ≤ 1 %
2. 1 Drive operation : When using the glass epoxy board (FR4 40 × 40 × 1.6mm), PW ≤ 10s
3. 2 Drive operation : When using the glass epoxy board (FR4 40 × 40 × 1.6mm), PW ≤ 10s
4. Tch = 25°C , Rg > 50 Ω

Typical Operation Characteristics

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	3.5	—	—	V	
	V_{IL}	—	—	1.2	V	
Input current	I_{IH1}	—	—	100	µA	Vi = 5V, V_{DS} = 0
(Gate non shut down)	I_{IH2}	—	—	50	µA	Vi = 3.5V, V_{DS} = 0
	I_{IL}	—	—	1	µA	Vi = 1.2V, V_{DS} = 0
Input current	$I_{IH(sd)1}$	—	0.53	—	mA	Vi = 8V, V_{DS} = 0
(Gate shut down)	$I_{IH(sd)2}$	—	0.2	—	mA	Vi = 3.5V, V_{DS} = 0
Shut down temperature	T_{sd}	—	175	—	°C	Channel temperature
Hysteresis temperature	Thr	—	120	—	°C	Channel temperature
Gate operation voltage	V_{op}	3.5	—	12	V	

Electrical Characteristics (Ta = 25°C)

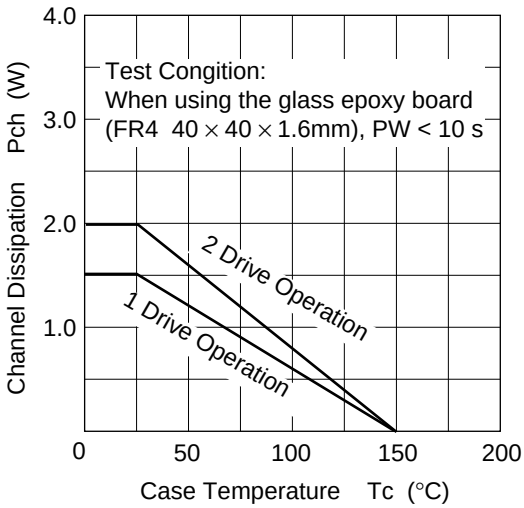
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	0.7	—	—	A	V_{GS} = 3.5 V, V_{DS} = 2 V
Drain current	I_{D2}	—	—	10	mA	V_{GS} = 1.2 V, V_{DS} = 2 V
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	I_G = 300 µA, V_{DS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	–2.5	—	—	V	I_G = –100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS1}	—	—	100	µA	V_{GS} = 5 V, V_{DS} = 0
	I_{GSS2}	—	—	50	µA	V_{GS} = 3.5 V, V_{DS} = 0
	I_{GSS3}	—	—	1	µA	V_{GS} = 1.2 V, V_{DS} = 0
	I_{GSS4}	—	—	–100	µA	V_{GS} = –2.4 V, V_{DS} = 0
Input current (shut down)	$I_{GS(op)1}$	—	0.53	—	mA	V_{GS} = 8 V, V_{DS} = 0
	$I_{GS(op)2}$	—	0.2	—	mA	V_{GS} = 3.5 V, V_{DS} = 0
Zero gate voltege drain current	I_{DSS1}	—	—	10	µA	V_{DS} = 60 V, V_{GS} = 0
Zero gate voltege drain current	I_{DSS2}	—	—	10	mA	V_{DS} = 48 V, V_{GS} = 0 Ta = 125°C
Gate to source cutoff voltage	$V_{GS(off)}$	1.4	—	2. 5	V	I_D = 1 mA, V_{DS} = 10V
Static drain to source on state resistance	$R_{DS(on)}$	—	130	200	mΩ	I_D = 1 A, V_{GS} = 5 V [Note5]
Static drain to source on state resistance	$R_{DS(on)}$	—	110	160	mΩ	I_D = 1 A, V_{GS} = 10 V [Note5]
Forward transfer admittance	$\|y_{fs}\|$	0.5	2.5	—	S	I_D = 1 A, V_{DS} = 10 V [Note5]
Output capacitance	Coss	—	139	—	pF	V_{DS} = 10V , V_{GS} = 0 f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	4.2	—	µs	I_D = 1 A, V_{GS} = 5 V
Rise time	t_r	—	20	—	µs	R_L = 30 Ω
Turn-off delay time	$t_{d(off)}$	—	1	—	µs	
Fall time	t_f	—	1	—	µs	
Body–drain diode forward voltage	V_{DF}	—	0.82	—	V	I_F = 2A, V_{GS} = 0
Body–drain diode reverse recovery time	t_{rr}	—	55	—	ns	I_F = 2A, V_{GS} = 0 diF/ dt = 50 A/µs
Over load shut down operation time [Note6]	t_{os1}	—	15	—	ms	V_{GS} = 5 V, V_{DD} = 16 V

Note: 5. Pulse test

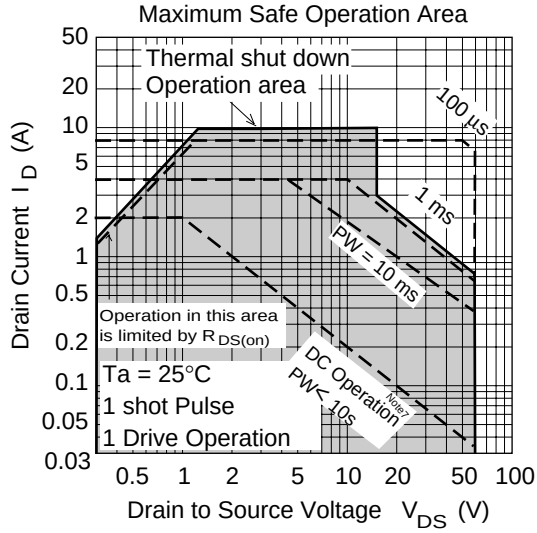
6. Including the junction temperature rise of the over loaded condition

Main Characteristics

Power vs. Temperature Derating

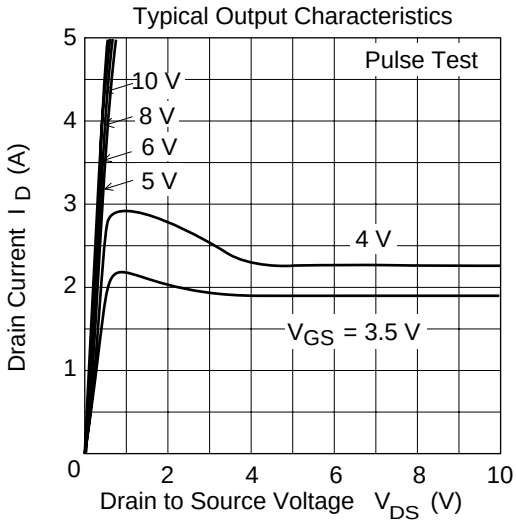


Maximum Safe Operation Area

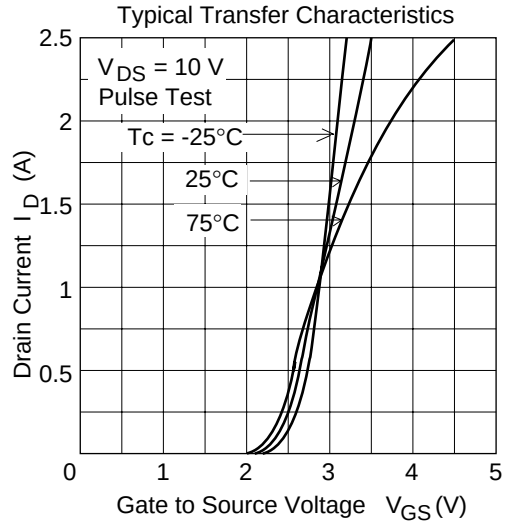


Note7:
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)

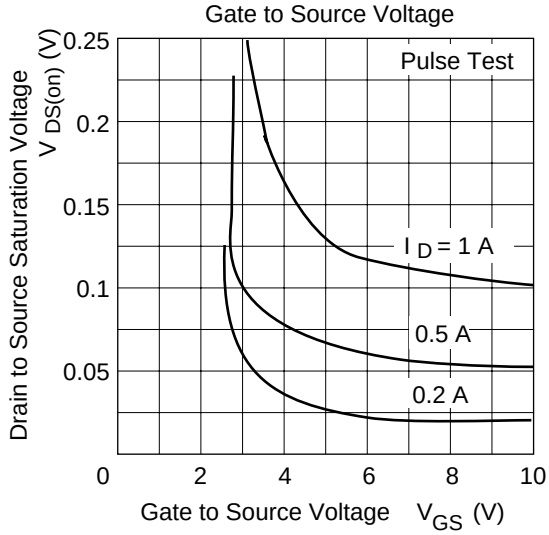
Typical Output Characteristics



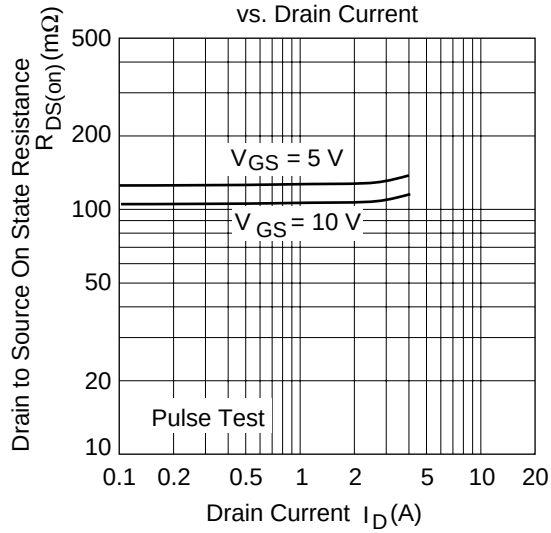
Typical Transfer Characteristics



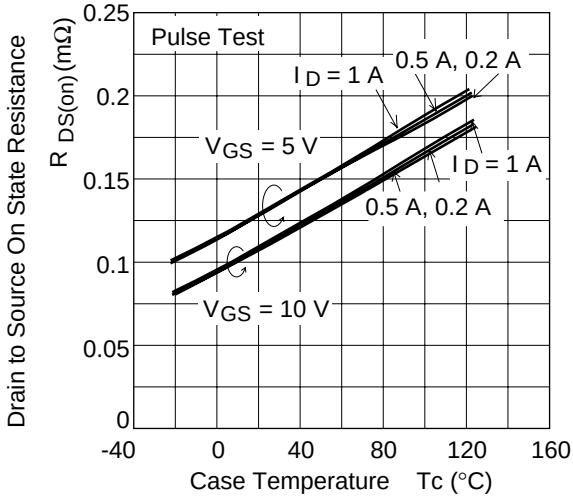
Drain to Source Saturation Voltage vs. Gate to Source Voltage



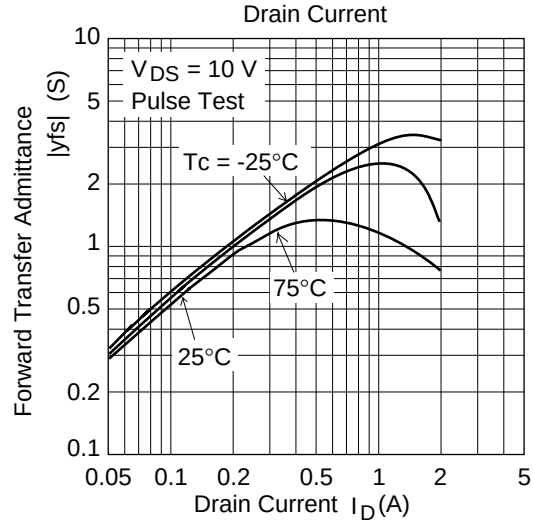
Static Drain to Source Sate Resistance vs. Drain Current



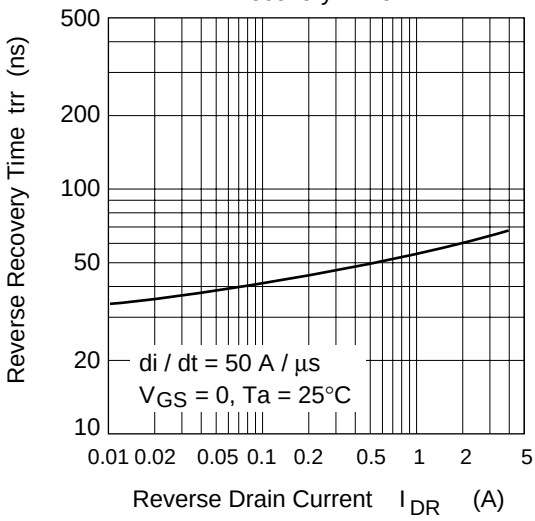
Static Drain to Source on State Resistance vs. Temperature



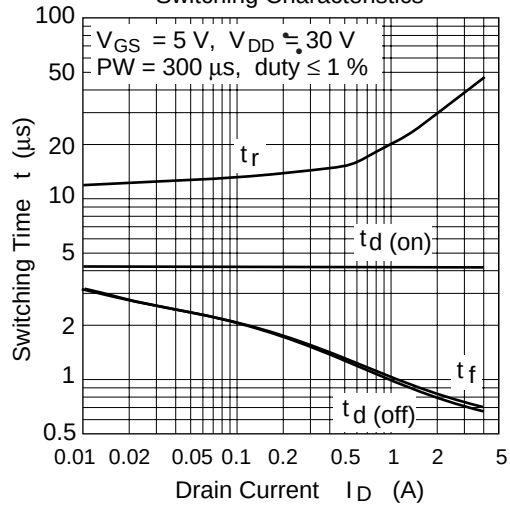
Forward Transfer Admittance vs. Drain Current



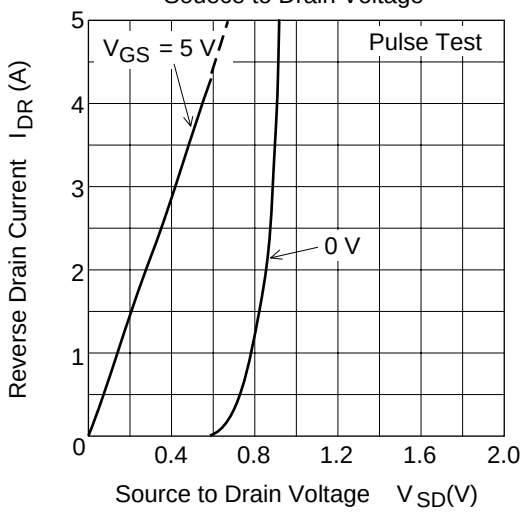
Body to Drain Diode Reverse Recovery Time



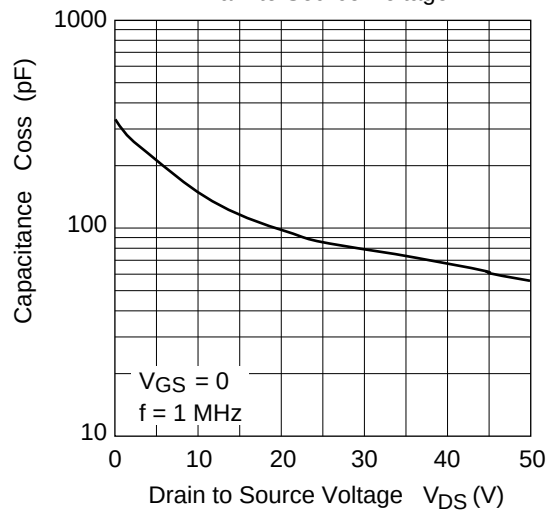
Switching Characteristics



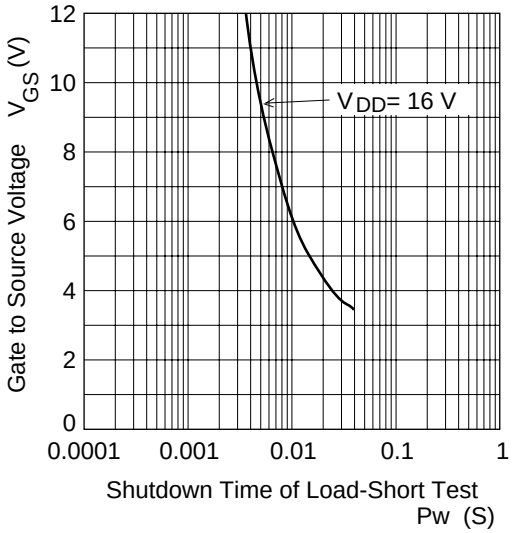
Reverse Drain Current vs. Souece to Drain Voltage



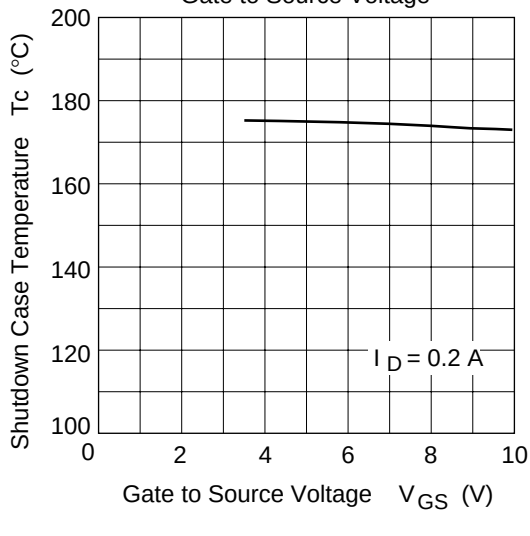
Typical Capacitance vs. Drain to Source Voltage



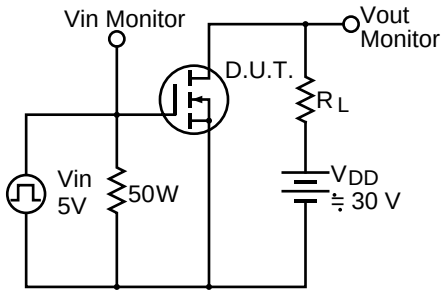
Gate to Source Voltage vs.
Shutdown Time of Load-Short Test



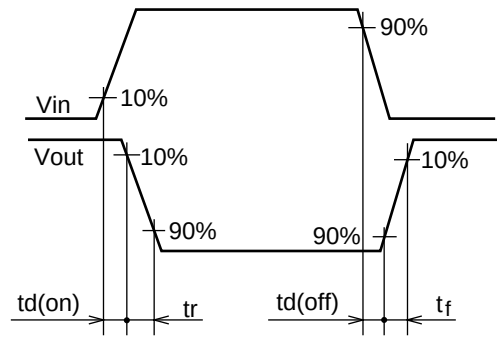
Shutdown Case Temperature vs.
Gate to Source Voltage



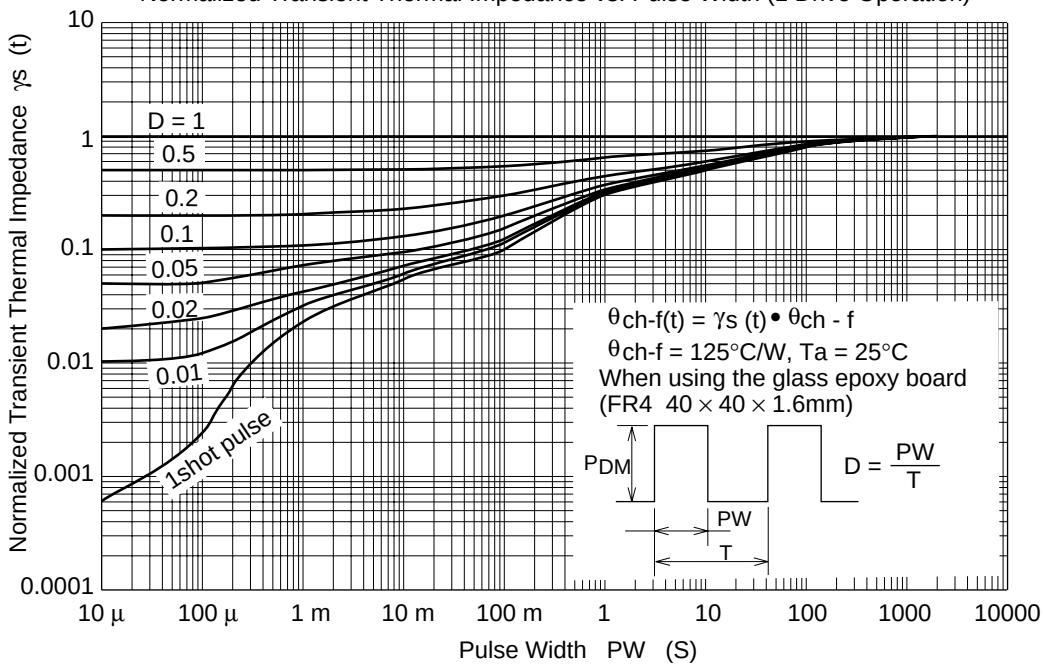
Switching Time Test Circuit



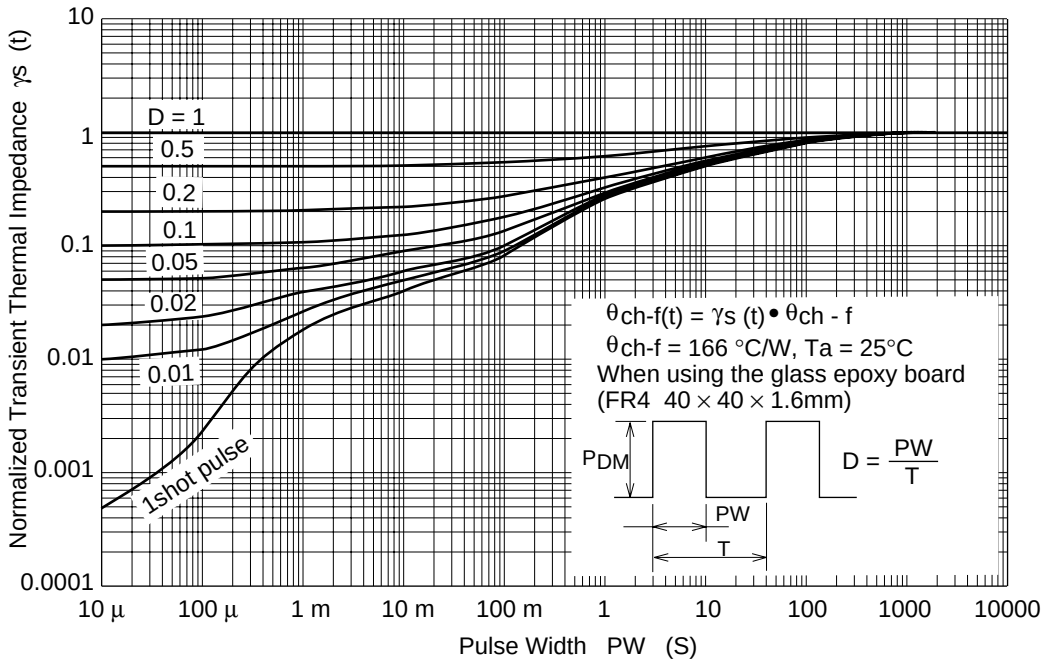
Waveform



Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)



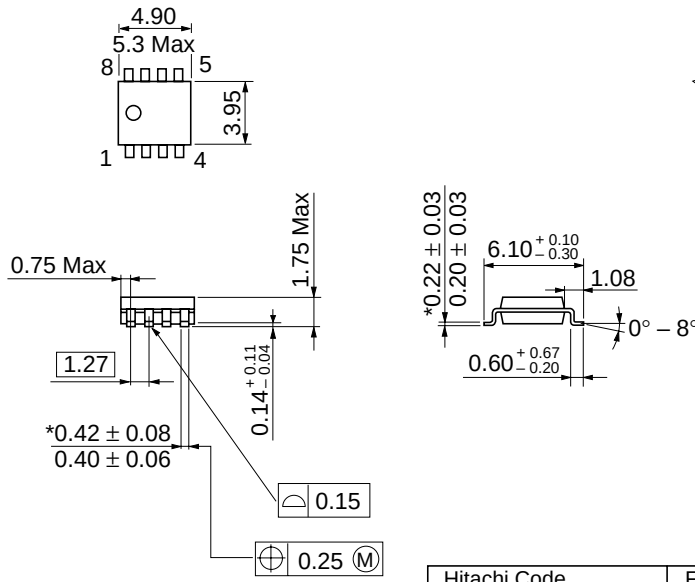
Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)



Package Dimensions

As of January, 2001

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-8DA
JEDEC	Conforms
EIAJ	—
Mass (reference value)	0.085 g

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